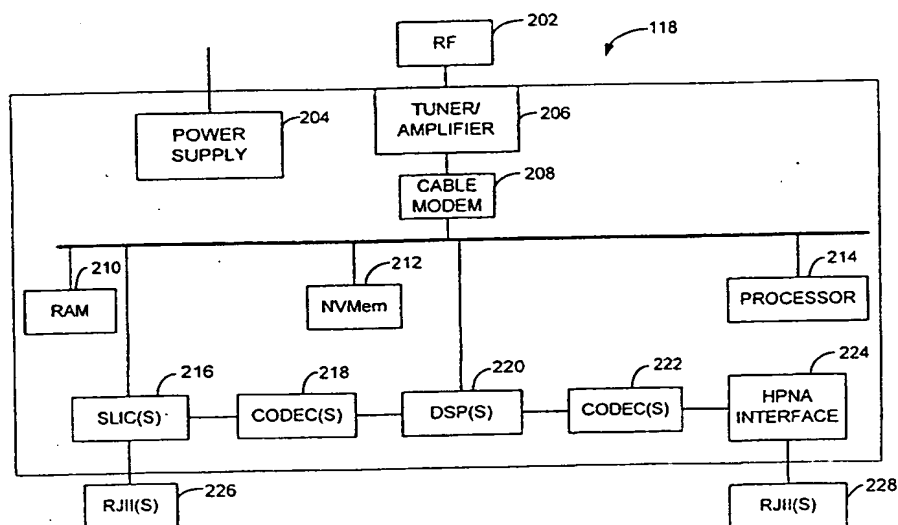




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> : <b>H04M 11/06, H04Q 11/04</b>		<b>A1</b>	(11) International Publication Number: <b>WO 00/62522</b> (43) International Publication Date: 19 October 2000 (19.10.00)
(21) International Application Number: PCT/US00/09207 (22) International Filing Date: 7 April 2000 (07.04.00) (30) Priority Data: 60/128,602 8 April 1999 (08.04.99) US (71) Applicant (for all designated States except US): GENERAL INSTRUMENT CORPORATION [US/US]; 101 Tournament Drive, Horsham, PA 19044 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): MOORE, Richard, Jr. [US/US]; 257 Freed Road, Harleysville, PA 19438 (US). BLUM, William [US/US]; 597 Quarry Road, Harleysville, PA 19438 (US). (74) Agents: KULAS, Charles, J. et al.; Townsend and Townsend and Crew LLP, 8th floor, Two Embarcadero Center, San Francisco, CA 94111 (US).			(81) Designated States: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: COMMUNICATIONS GATEWAY WITH INTEGRATED HOME PHONELINE DIGITAL NETWORKING INTERFACE



## (57) Abstract

A hybrid-fiber, coax IP telephony device supports multiple phone lines without requiring new telephone wires to be installed. One embodiment adapts an integrated HomePNA interface in a Communications Gateway to support a standard connector, such as an RJ11 connector, for connecting to existing home phone wire. The first telephone line can be with traditional analog signals compliant with today's telephones. The second, third and higher lines can be achieved by sending digital voice packets over the HomePNA network to HomePNA receivers plugged into wall jacks. Those receivers translate the HomePNA signals to traditional telephone signals to support traditional phones.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

## COMMUNICATIONS GATEWAY WITH INTEGRATED HOME PHONELINE DIGITAL NETWORKING INTERFACE

### CLAIM OF PRIORITY

5 This application claims priority from co-pending U.S. Provisional Patent Application No. 60/128,602 filed 4/8/99 entitled COMMUNICATIONS GATEWAY WITH INTEGRATED HOME PHONELINE NETWORKING ALLIANCE COMPLIANT INTERFACE, which is hereby incorporated by reference, as if set forth in  
10 full in this document, for all purposes.

### BACKGROUND OF THE INVENTION

The present invention relates in general to communications systems and more specifically to a communications system using hybrid-fiber coax networks.

15 Digital communications are becoming increasingly important and prevalent in all aspects of life. Currently there is an effort to bring digital networks to homes, both to allow hardware devices within the homes to communicate and also to allow devices in the homes to communicate with external devices. Examples include telephone communication, Internet access, personal computer (PC) communication with  
20 local peripherals such as printers, scanners, other PCs, etc.

One approach to an in-home network uses much of a home's existing telephone wiring to permit an ethernet-type network over the existing wiring. Connections to the wiring by devices within the home can be made via the existing telephone jacks (e.g., RJ11 connectors). One popular standardized approach is known as  
25 the Home Phonline Networking Alliance (HomePNA). See, for example, [www.homepna.org](http://www.homepna.org) for more information. HomePNA has the advantages that the wiring is often already in place so that multiple connectors are present in different rooms. Also, telephone devices and connectors are standardized – a single connector type is used for almost all devices and connections. The existing wiring can also be used to support fairly  
30 high local data rates.

However, some problems exist with the HomePNA approach. One problem is that many homes are not adequately wired. There may be only a single telephone line at one or two connectors in the house. If networking is to be available in

more rooms, then additional wiring must be run through the walls at a relatively high expense to the user. Also, The data rate, or bandwidth, to the home from a telephone switch, Internet or other communication systems "backbone" may be limited. The data rate over traditional hard-wired lines is generally much lower than the rates that can be achieved over other physical links such as fiber-optic, coaxial, radio-frequency transmissions, etc. Another problem is that it may be difficult to support multiple phones, computers, peripherals and other equipment on the limited amount of hard wiring that exists in a large number of homes.

Thus, it is desirable to provide an invention that overcomes one or more of the shortcomings in the prior art.

### SUMMARY OF THE INVENTION

The present invention provides an efficient and flexible interface for adding new lines and services to a home phoneline network by using the limited existing hardwire lines in a home. In a preferred embodiment, the home phoneline network is adapted to a hybrid-fiber coax link to an external communications network such as the Internet. A telephony device is provided that allows multiple devices to connect to a single standard telephone jack. Digital data communication is multiplexed over existing wiring and demultiplexed at a receiving unit. This provides for easy addition of virtual telephone "wires" to customer premises as the customers order additional services, lines or features.

A preferred embodiment of the invention provides a hybrid-fiber coax Internet Protocol (IP) telephony device that supports multiple phone lines without requiring new telephone wires to be installed. One embodiment adapts an integrated HomePNA interface in a communications gateway to support a standard connector, such as an RJ11 connector, for connecting to existing home phone wire. The first telephone line can be with traditional analog signals compliant with today's telephones. The second, third and higher lines can be achieved by sending digital voice packets over the HomePNA network to HomePNA receivers plugged into wall jacks. Those receivers translate the HomePNA signals to traditional telephone signals to support traditional phones.

Another embodiment is a system providing communications interconnectivity. The system includes an analog communication line; a communications gateway coupled to the analog communication line, wherein the communications gateway

converts between analog signals and digital signals; one or more digital communication lines coupled to the communications gateway; and one or more user interfaces coupled to the digital communication lines.

5 The HomePNA interface could also be used to carry information other than voice. It could carry video, audio, data, FAX information, control information for home automation, etc.

Details of the invention are provided below and in the accompanying documents.

## BRIEF DESCRIPTION OF THE DRAWINGS

10

## DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Fig. 1 shows a system-level block diagram using the present invention.

15 In Fig. 1, overall communications system 100 includes primary communication networks IP network 110 and telephone network 108. These are, for example, the Internet and the standard public telephone network. Note that any manner of primary communication networks can be included in the overall system. For example, the cellular telephone network, radio-frequency, microwave, or other communication networks can be included.

20 IP Network 110 includes Call Management System 102 and Operation Support System 104 to symbolically represent additional infrastructure to handle, for example, voice-over-IP telephone calls over the Internet, billing, provisioning, etc., of Internet resources. Gateway 106 allows the transfer of digital information from the Internet to the analog or digital telephone system so that telephone calls can be made to and from user telephones 114. Network Management System 116 handles other Internet  
25 functions.

Cable Modem Termination System 112 provides for transfer of information from the Internet to a cable network, such as a cable television network. In a preferred embodiment, the cable network includes hybrid fiber-coax lines 120 that are used to distribute digital information to homes, businesses or other destinations (i.e.,  
30 "end-points") and sources of information. Interface 118 is the subject of the present invention. In a preferred embodiment, interface 118 provides for the transfer of information between the hybrid fiber-coax network and devices at the end-point such as device 120. Device 120 can be a telephone, computer, peripheral, set-top box, or any of many other devices that send or receive information. In a preferred embodiment, the

devices are either standard telephone handsets or devices which comply with the HomePNA standard for digital data transfer over a home network.

Fig. 2 shows subsystems of interface 118 of Fig. 1.

In Fig. 2, information modulated by an rf carrier is transferred to and from hybrid fiber-coax as indicated at 202. Tuner/Amplifier 206 can be a two-way data communication device. Cable modem 208 is used to send and receive digital data to the hybrid fiber-coax link. Bus 230 provides a communications path for cable modem 208, random access memory (RAM) 210, non-volatile memory (NVMEM) 212, processor 214, subscriber line interface circuit 216, digital signal processors 220 and other devices (not shown), as desired. Transfer of information can be under the direction of processor 214, any of the devices shown, by a bus master (not shown), or by other means.

Standard RJ11 telephone jacks are provided so that digital and analog telephone equipment can be connected to the interface. A wide variety of other devices can be coupled to the interface via the jacks. In a preferred embodiment, any device supported by the HomePNA standard can be attached to the interface. The interface can also be designed to support other standards or custom communications and devices.

A preferred embodiment of the invention is designed to handle a single analog and multiple digital voice communication lines. An analog line can be connected via jack 226. SLIC 216 and other subsystems within interface 118 convert the analog voice information to digital information for transfer within the home network or to the external network. Digital devices, including telephones, can be connected via jack 228 to HPNA interface 224. Codecs 218 and 222 act to encode and decode digital information. DSPs 220 can process the digital information before transfer.

Thus, digital telephone devices, and other digital devices such as computers, peripherals, consumer electronics, etc., can be connected to the interface via HPNA interface 224 and connectors 228. The original analog telephone line is still preserved via SLIC 216 and connectors 226. All of the benefits of HomePNA networking can be achieved while still maintaining the original analog line and providing for additional digital telephone lines without requiring additional wiring at the end-point location.

Although the present invention has been discussed with respect to specific embodiments, these embodiments are merely illustrative, and not restrictive, of the invention. The scope of the invention is to be determined solely by the appended claims.

WHAT IS CLAIMED IS:

- 1                   1.       A system providing communications interconnectivity, the system  
2 comprising:  
3                   an analog communication line;  
4                   a communications gateway coupled to the analog communication line,  
5 wherein the communications gateway converts between analog signals and digital signals;  
6                   one or more digital communication lines coupled to the communications  
7 gateway; and  
8                   one or more user interfaces coupled to the digital communication lines.
- 1                   2.       The system of claim 1, wherein the communications lines are lines  
2 in a telephone system, wherein the user interfaces are telephone receivers/transmitters.
- 1                   3.       A system as substantially described herein.

1/2

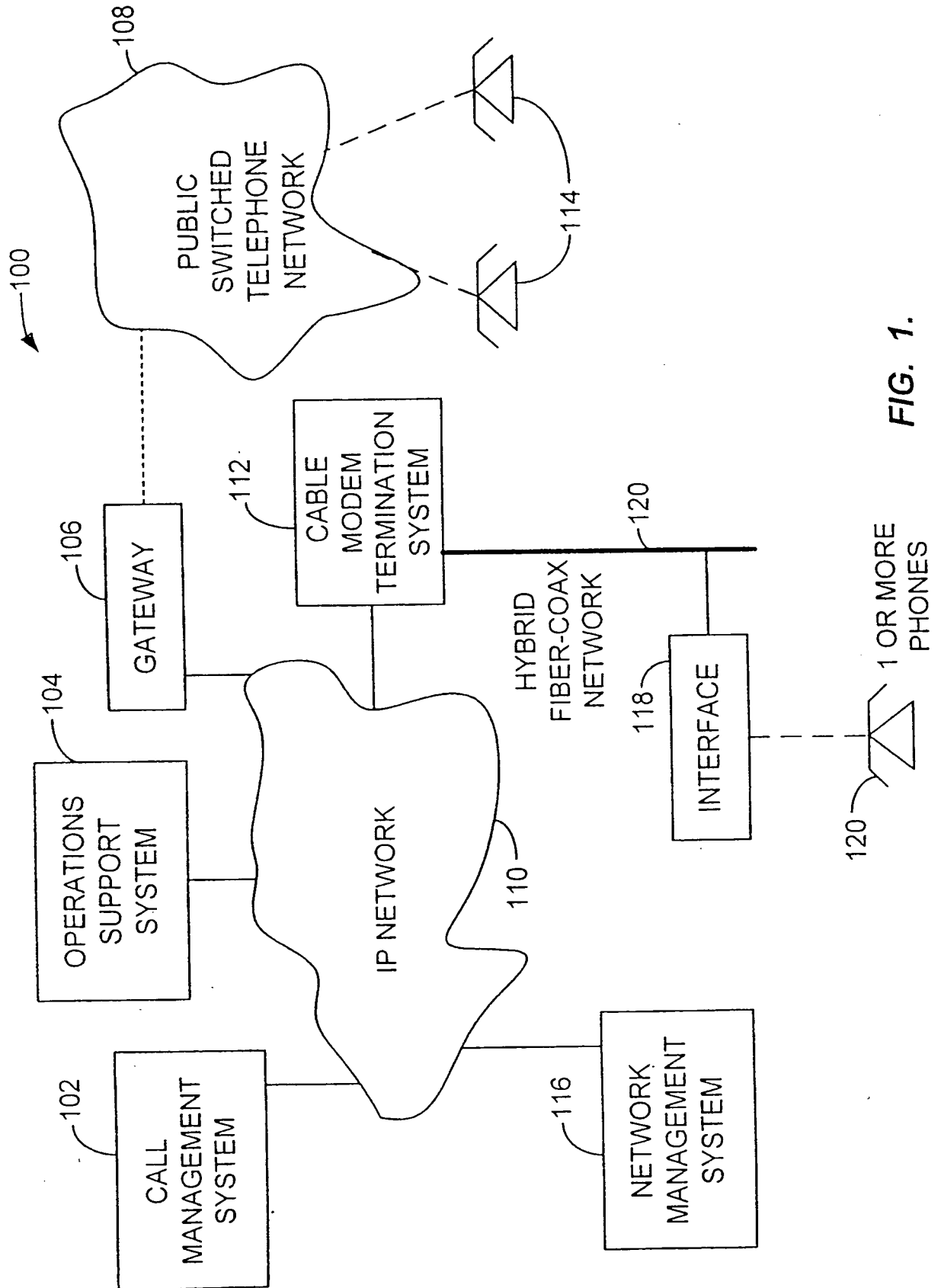


FIG. 1.



2/2

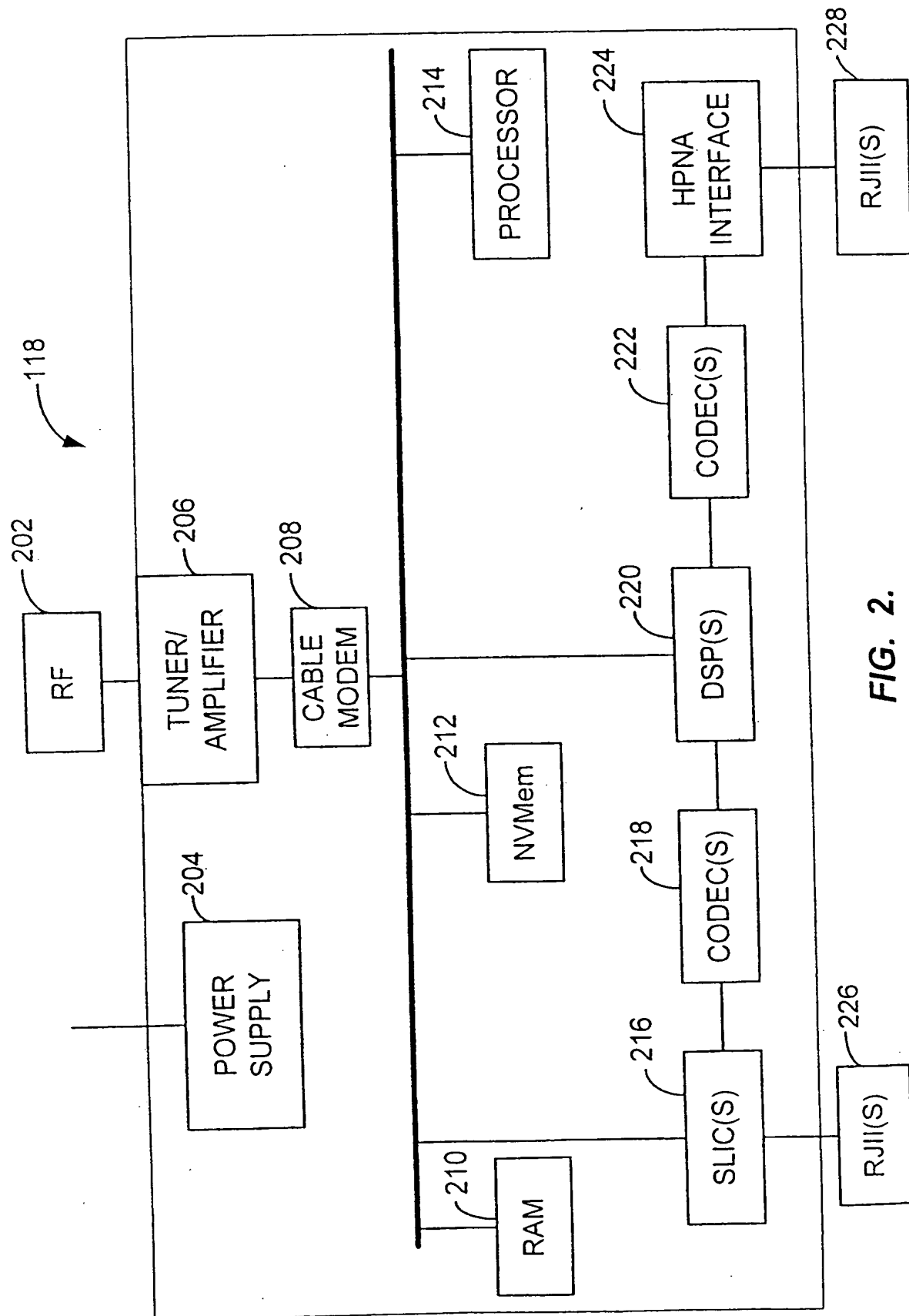


FIG. 2.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/09207

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 H04M11/06 H04Q11/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04M H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, IBM-TDB, COMPENDEX

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 572 524 A (HARADA YUICHI ET AL) 5 November 1996 (1996-11-05) abstract; figure 16 column 1, line 40 -column 5, line 3 -----	1-3
P,X	TDSOFT: "Voice over ATM Access Gateway for Cable Networks" INTERNET ARTICLE, 'Online! XP002144065 Retrieved from the Internet: <URL:http://www.tdsoft.com/products/ap11.z ip> 'retrieved on 2000-08-01! the whole document -----	1-3

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

1 August 2000

Date of mailing of the international search report

14/08/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax: (+31-70) 340-3016

Authorized officer

Willems, B

information on patent family members

PCT/US 00/09207

Form PCT/ISA/210 (patent family annex) (July 1992)

**THIS PAGE BLANK (USPTO)**